

# PATENT SPECIFICATION

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## (54) WIPERS, PRIMARILY FOR VEHICLE HEADLAMPS

(71) We, TRICO-FOLBERTH LIMITED, a British company, of Great West Road, Brentford, Middlesex, TW8 9HP, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to wipers which have been devised primarily for use in wiping the front face of a vehicle headlight. However, such wipers may also be used for other purposes, for example to wipe a transparent member protecting the lens of an outdoor television camera.

According to the present invention, a wiper suitable for wiping a transparent member comprises a wiper arm, a wiper blade, and a coupling; the blade consisting of a squeegee and a backing strip; the coupling including a first portion attached to the backing strip substantially without any play, and a second portion alongside the first portion and rigid with it; and the arm having adjacent to one end a straight portion and a curved terminal portion, the terminal portion extending in approximately a semicircle, from a junction with the straight portion in alignment therewith, to a free end directed towards the rest of the arm, the curved portion thus constituting a hook-shaped extremity and a shoulder at the junction of the straight portion with the rest of the arm, the shoulder facing towards the hook-shaped extremity; with said second portion of the coupling including two opposed faces able to receive the straight portion of the arm with substantially no lateral play therebetween, while the hook-shaped extremity engages partly around a co-operating surface on the second portion, and the shoulder co-operates with an abutment on the second portion substantially to prevent longitudinal play of the straight portion relatively to the coupling, while permitting angular movement of the arm relatively to the coupling, through an arc, the hookshaped extremity and the co-operating surface acting as a pivot joint

during the angular movement; extension of the angular movement beyond one limit of the arc being accompanied by the shoulder ceasing to co-operate with the abutment.

As compared with wipers currently available, an advantage of wipers according to the present invention is that a minimum overall height is achieved.

The accompanying drawings show one example of a wiper according to the present invention. As a matter of convenience, the wiper will be described as if it were in an attitude to co-operate with a flat surface facing vertically upwards, although in practice it is likely to be used in conjunction with a surface lying approximately in a vertical plane. In the accompanying drawings:—

Figure 1 is a side elevation of a squeegee;

Figure 2 is a plan of a backing strip;

Figure 3 is a plan of a coupling;

Figure 4 is a view of the coupling from beneath;

Figure 5 is an end elevation of the coupling, looking in the direction of the arrow V in Figure 4;

Figure 6 is a longitudinal vertical section through the coupling, on the line VI—VI in Figure 3;

Figure 7 is a plan of a wiper arm;

Figure 8 is a side elevation of a wiper arm (this shows the entire arm, in two parts which should be considered as joined together on the lines A—A);

Figure 9 is a diameter side elevation of the coupling and an end of the arm, showing relative movement during assembly;

Figure 10 is a diagrammatic side elevation of the wiper, showing relative movement during use; and

Figure 11 is a cross section, taken on the line XI—XI in Figure 3, showing the wiper assembled.

The coupling 2, shown in Figures 3 to 6 and 9 to 11, is an integral moulding of a hard plastics material (e.g. an acetal copolymer), of generally rectangular overall shape. Alternatively, however, the coupling could be an aluminium or a zinc die casting. As is

apparent particularly from Figure 11, the coupling, considered functionally, consists of a first portion 4 attached to the wiper blade, and a second portion 6 rigid with and alongside the first portion, and connected to the wiper arm.

The wiper blade, as shown in Figures 1 and 2, consists of a squeegee 8 and a backing strip 16, the transverse centre lines of which have been indicated by the references C/L. The squeegee is of flexible rubber-like material, and is a strip uniform cross section includes a wiping lip 10 and two pairs of lateral flanges 12 and 14, which define opposed lateral grooves for receiving the backing strip.

The backing strip 16 consists of an integral stamping of resilient sheet metal, having the shape shown in Figure 2. Essentially, it consists of two similar side members 18 and 20, interconnected by bridges 22 at the ends. The side members 18 and 20 define between each other a central slot 24, which is of uniform width, except for an enlargement 26 near one end. Before assembling the wiper blade and the coupling, the squeegee is first assembled to the backing strip. This is done by pushing the upper part of one end of the squeegee through the enlargement 26, then the squeegee is pulled along the slot 24, and finally the squeegee is somewhat compressed longitudinally to enable the other upper end of the squeegee to pass upwards through the enlargement 26, the squeegee then being allowed to extend longitudinally so as to occupy the entire length of the slot 24. The relative position of the squeegee and backing strip is then as shown in Figure 11.

The squeegee and backing strip are then assembled with the coupling 2 by positioning the coupling at one end of the backing strip, with slots 32 in the coupling aligned with the side members 18 and 20 of the backing strip. The backing strip is then urged longitudinally to slide along the slots 32, until one or two wider portions adjacent opposed pairs of shoulders 34 reaches the coupling. A larger force must then be exerted on the backing strip, causing a corresponding pair of ramp surfaces 33 to compress the side members of the backing strip together. Said wider portion of the backing strip may then pass along the slots 32 in the coupling until it emerges therefrom, whereupon the side members 18 and 20 spring apart. The distance between each opposed pair of shoulders 34 is arranged to be substantially equal to the length of the coupling, so that there is little or no longitudinal play between the backing strip and the coupling.

The connection between the wiper arm and the coupling is, as explained more fully

below, constructed so as to permit connection and disconnection when desired, and to permit relative pivotal movement of the coupling and the arm about an axis transverse to the length of the wiper blade, and approximately parallel to the surface of the transparent member to be wiped. In Figure 11 the surface is indicated by the line B—B and the pivot axis by the line C—C.

The wiper arm, as shown in Figures 7 and 8, consists of a springy strip 36 and a hub member 38. The hub member is a metal die casting, and is fastened to the strip 36 by rivets 40. The hub member contains a tapered bore 42, which in use is fitted onto an end of an operating shaft (not shown). This shaft is given an oscillating motion by a motor, in a manner common in windscreen wiper mechanisms.

The strip 36 is of uniform width throughout most of its length. Adjacent to its end remote from the hub, the width is slightly reduced so as to form at least one, but preferably two shoulders 44 facing towards a straight portion 43 terminating in a hook-shaped extremity 46, which is approximately semi-cylindrical.

In the second portion 6 of the coupling, there is a longitudinal channel extending upwards into the coupling from below, and defined by two opposed faces 48, which are able to receive the portion 43 of the arm between them with substantially no lateral play. The upward boundary of the channel is constituted by two sloping surfaces 50 (Figure 6), and two part-cylindrical transverse surfaces 52, between which is a rectangular window 54. The window is enlarged longitudinally above the surfaces 52.

It will be apparent from Figure 11 that, when assembled, the wiper arm lies alongside the backing strip so that the wiper assembly is of minimal height, reckoned upwards from the surface B—B. According to particular circumstances, one may wish to have the wiper blade on one side or the other of the wiper arm. According to which position is required, the hook-shaped extremity 46 of the wiper arm engages partly around one or other of the part-cylindrical surfaces 52, each surface 52 thus constituting a co-operating surface on the second portion.

A procedure for assembling the coupling onto the wiper arm is illustrated in Figure 9—it will be appreciated however, that if the wiper is for use with a vehicle headlamp, there may be little room available for manipulating the coupling/blade sub-assembly, with the result that said sub-assembly may need to approach the arm at an acute angle rather than perpendicularly thereto as shown in Figure 9. The arm

is considered as stationary, while the coupling, with the wiper blade already attached to it, but not shown in Figure 9 for simplicity, is movable. The starting position of the second portion of the coupling is shown at 201. The coupling is moved horizontally to the right, until the hook-shaped extremity 46 has emerged through the window 54, and then the coupling is moved bodily somewhat downwards and back a short distance to the left, all as indicated by the arrow 211, until the coupling reaches the position shown at 202. Then the coupling is rotated through 90°, as indicated by the arrow 212, into the position indicated at 203. This position 203 is a central position within the range of positions of use (discussed below with reference to Figure 10). In all these positions of use, the shoulders 44 of the arm are adjacent one of a pair of part-cylindrical end surfaces 56 of the coupling, ensuring that substantially the only relative motion possible between the coupling and the wiper arm is oscillation around a transverse horizontal axis (the axis shown at C—C in Figure 11 and indicated at C in Figure 10). Each end surface 56 thus constitutes an abutment on the second portion, with the hook-shaped extremity 46 and the co-operating surface 52 acting as a pivotal joint.

Figure 10 shows the full range of relative movement of the coupling and the wiper arm allowable in use, as indicated by the double-ended arrow 213. In Figure 10, the positions of the wiper blade are indicated in outline at 804 and 805. In one extreme position of the coupling, indicated at 204, one of the surfaces 50 forming the upper boundary of the channel in the coupling engages the portion 43 of the wiper arm, so that further pivotal movement is not possible. In the opposite extreme position, indicated at 205, the shoulders 44 are adjacent the lowest part of the adjacent end face 56 of the coupling, and any further pivotal movement will permit the commencement of dis-assembly, by a reversal of the movement indicated at 212 in Figure 9, followed by reversal of the movement 211.

Clearly, when the hook-shaped extremity 46 extends around more than 180° of the surface 52, it is a snap-fit thereon, that is to say is self-locating, and the shoulders 44 can be arranged so that they do not usually bear against their adjacent end face 56, even though they are in close proximity thereto. Alternatively, however, if the hook extends to bear against their adjacent end face 56, which must then be an arc of a circle of centre C. The above observations are still applicable if the integrally moulded part-cylindrical surfaces 52 are replaced by, for example, transverse metal pins of

circular or hexagonal cross section.

If, as is commonly the case, the transparent member to be wiped has a convex part-spherical surface, then the backing strip has a convex part-spherical surface, then the backing strip should be made curved in side elevation, with a uniform curvature, in unstressed condition, of smaller radius than the radius of curvature of the surface of the transparent member. The unstressed shape of the wiper arm in side elevation should be such that the hook-shaped extremity 46 would be in contact with, or even a little below, the surface of the transparent member. Then, in the position of use, the presence of the wiper blade and coupling causes the wiper arm to be deflected, and thereby exert a force on the coupling towards the transparent member. This force is sufficient to cause the central part of the length of the wiping lip of the blade to make contact with the transparent member, while the pressure exerted by the wiper arm on the coupling is distributed along the length of the squeegee as a result of deflection of the backing strip into a condition of greater radius of curvature than its unstressed condition. In this way, the entire length of the wiping lip is pressed into contact with the transparent member.

The shape of the wiper arm in side elevation requires to be designed in conjunction with knowledge of the orientation of the wiper operating shaft in relation to the transparent member. For example, in a headlamp wiping installation, the overriding factor may be the space available within a motor vehicle body adjacent to the headlight to accommodate the shaft and its driving mechanism. The shape of the wiper arm should also be such that it can take up that limited universal adjustment of the headlamp which is necessary for aligning the headlamp with the or each of the other headlamps, as well as with the road ahead.

#### WHAT WE CLAIM IS:—

1. A wiper suitable for wiping a transparent member, comprising a wiper arm, a wiper blade, and a coupling; the blade consisting of a squeegee and a backing strip; the coupling including a first portion attached to the backing strip substantially without any play, and a second portion alongside the first portion and rigid with it; and the arm having adjacent to one end a straight portion and a curved terminal portion, the terminal portion extending in approximately a semicircle, from a junction with the straight portion in alignment therewith, to a free end directed towards the rest of the arm, the curved portion thus constituting a hook-shaped extremity, and a

- shoulder at the junction of the straight portion with the rest of the arm, the shoulder facing towards the hook-shaped extremity; with said second portion of the coupling including two opposed faces able to receive the straight portion of the arm with substantially no lateral play therebetween, while the hook-shaped extremity engages partly around a cooperating surface on the second portion, and the shoulder cooperates with an abutment on the second portion substantially to prevent longitudinal play of the straight portion relatively to the coupling, while permitting angular movement of the arm relatively to the coupling through an arc, the hook-shaped extremity and the cooperating surface acting as a pivot joint during the angular movement; extension of the annular movement beyond one limit of the arc being accompanied by the shoulder ceasing to cooperate with the abutment.
2. A wiper according to claim 1, in which said abutment is an end face of the second portion.
3. A wiper according to claim 2, in which said end face is part-cylindrical.
4. A wiper according to any preceding claim, in which said co-operating surface is at least part-cylindrical.
5. A wiper according claim 4, in which angular movement of the arm relatively to the coupling is limited, in one sense, by a sloping surface of the second portion extending tangentially to the co-operating surface.
6. A wiper according to any preceding claim, in which the second portion of the coupling includes a pair of co-operating surfaces and a respective pair of abutments.
7. A wiper according to any preceding claim, in which the coupling is integrally formed.
8. A wiper according to claim 7, in which the coupling is an integral moulding of a plastics material.
9. A wiper according to any preceding claim, in which the hook-shaped extremity is a snap-fit on the co-operating surface.
10. A wiper according to any preceding claim, in which there is a pair of shoulders facing towards the hook-shaped extremity at the junction of the straight portion with the rest of the arm, these shoulders being formed by a reduction in the width of the arm.
11. A wiper according to any preceding claim, in which retention of the blade with the coupling is assisted by opposed pairs of shoulders formed on the backing strip which abut respective end faces of the first portion.
12. A wiper according to claim 1 substantially as hereinbefore described with reference to the accompanying drawings.

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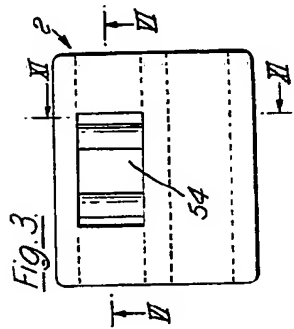
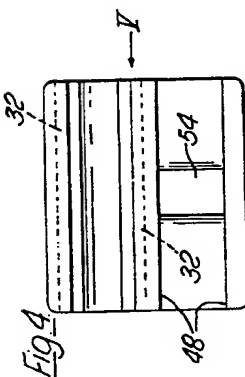
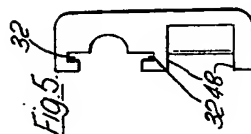
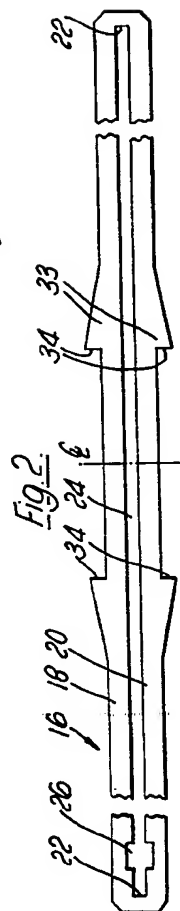
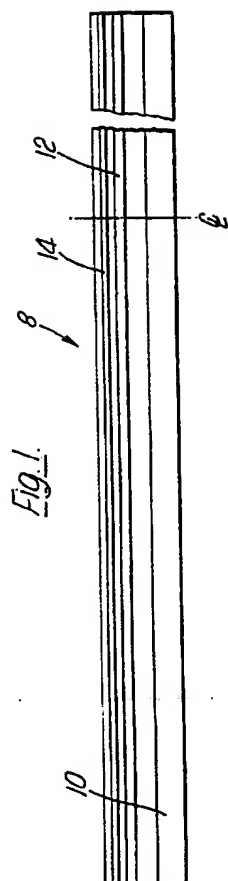
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Fig. 6.

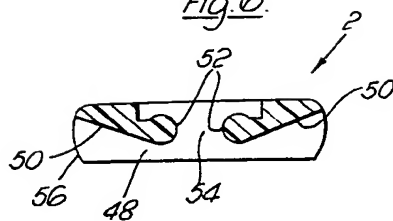


Fig. 7.

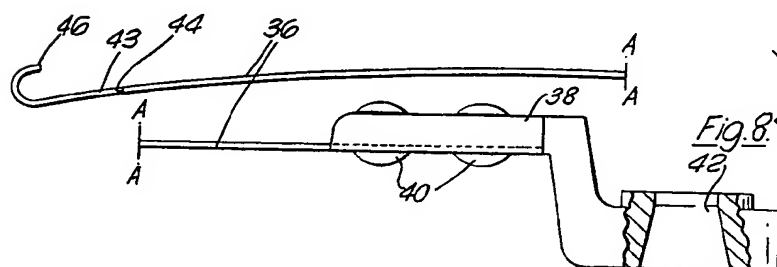
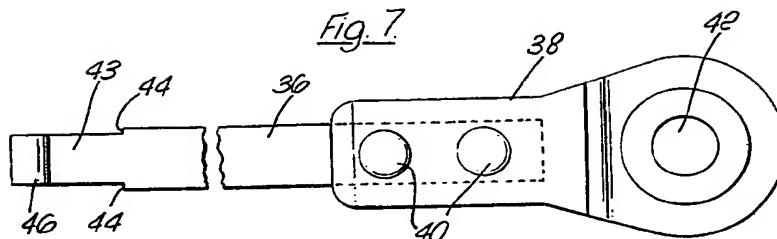


Fig. 8.

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Fig. 9.

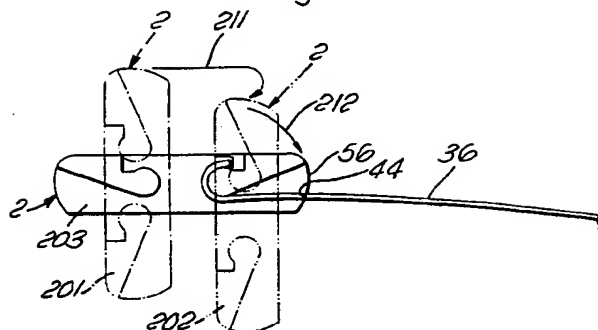


Fig. 10.

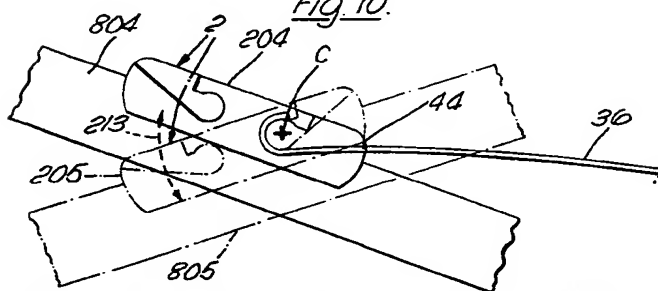
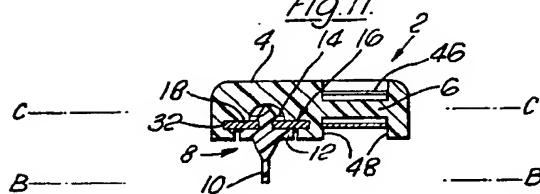


Fig. 11.



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